

Renewable Energy Resources

Program Mission

The pending FY 2002 Congressional Budget Request of \$237,477,000 for Renewable Energy Resources is \$135,702,000 less than the FY 2001 Enacted Appropriation of \$373,179,000. This amendment restores \$39,176,000 for some of the highest priority, critical research and development activities. This is consistent with the Department's budget principle to ensure a continued focus on the next generation of energy production. The amendment also restores funding to support the International Renewable Energy Program and the Renewable Energy Production Incentive Program, which are important to the mission requirements of the Department's energy portfolio.

Funding Profile

(dollars in thousands)

	FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
Renewable Energy Resources			
Biomass/Biofuels Energy Systems	80,500	+1,455	81,955
Hydrogen Research	13,900	+12,981	26,881
Hydropower	2,500	+2,489	4,989
Electric Energy Systems & Storage	33,927	+17,819	51,746
Renewable Support and Implementation	5,118	+4,432	9,550
All Other Renewable Energy Resources	101,532	0	101,532
Total, Renewable Energy Resources	<u>237,477</u>	<u>+39,176</u>	<u>276,653</u>

Funding by Site

(dollars in thousands)

	FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
Albuquerque Operations Office			
Los Alamos National Laboratory	4,737	+4,775	9,512
National Renewable Energy Laboratory	105,580	+5,005	110,585
Sandia National Laboratory	17,549	+1,677	19,226
Golden Field Office	38,424	+12,656	51,080
All Other	6,768	0	6,768
Total, Albuquerque Operations Office	173,058	+24,113	197,171
Chicago Operations Office			
Argonne National Laboratory	2,424	+1,250	3,674
Brookhaven National Laboratory	650	+400	1,050
Chicago Operations Office	110	0	110
Total, Chicago Operations Office	3,184	+1,650	4,834
Idaho Operations Office			
Idaho National Engineering and Environmental Laboratory	2,275	0	2,275
Idaho Operations Office	3,605	+2,489	6,094
Total, Idaho Operations Office	5,880	+2,489	8,369
Nevada Operations Office			
Nevada Operations Office	800	+680	1,480
Nevada Test Site	125	0	125
Total, Nevada Operations Office	925	+680	1,605
Oak Ridge Operations Office			
Office of Scientific and Technology Information	45	+369	414
Oak Ridge National Laboratory	15,758	+6,425	22,183
Total, Oak Ridge Operations Office	15,803	+6,794	22,597
Richland Operations Office			
Pacific Northwest National Laboratory	800	+400	1,200
Oakland Operations Office			
Lawrence Berkeley National Laboratory	2,805	+550	3,355
Lawrence Livermore National Laboratory	1,780	+700	2,480
Oakland Operations Office	2,250	0	2,250
Total, Oakland Operations Office	6,835	+1,250	8,085
National Energy Technology Laboratory.	10,850	+1,550	12,400
Savannah River Operations Office			
Savannah Operations Office	150	+150	300
Headquarters	19,992	+100	20,092
Total, Renewable Energy Resources	237,477	+39,176	276,653

Biomass/Biofuels Energy Systems

Mission Supporting Goals and Objectives

The amended budget request will enhance two elements within the Biomass/Biofuels Program (also referred to as the Biopower Energy Systems or Power Systems Program). Within Biopower Energy Systems (also referred to as the Biofuels Transportation Program), additional funding will support Small Modular Biopower activities to develop distributed, baseload renewable electricity systems that offer substantial environmental benefits to the Nation. Within Biofuels Energy Systems, the amendment will support Ethanol Production research and development to enhance work on promising liquid transportation fuels.

Biopower Energy Systems

The Small Modular Biopower program is developing biomass-fueled distributed generation systems. The widespread adoption of such systems is dependent upon their ability to use a broad range of feedstocks. The amended request will provide sufficient funding to allow the program to examine a much wider range of feedstocks, thus allowing the technology to stay on target and achieve its 2010 goal of 1,000 MW of installed capacity.

Biofuels Energy Systems

The proposed amendment supports research and development of Advanced Fermentation Organisms as part of the mission requirements of the Ethanol Production program. This work will complement the overall Biofuels Energy Systems mission to conduct research, development, and demonstration of technology to enable and support the expansion of an indigenous, integrated biomass-based industry that will reduce reliance on imported fuels; promote rural economic development; and provide for productive utilization of agricultural residues and municipal solid waste.

Funding Schedule

(dollars in thousands)

	FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
Biopower Energy Systems			
Thermochemical Conversion	4,000	0	4,000
Systems Development	25,900	+670	26,570
Feedstock Production	3,500	0	3,500
Regional Biomass Energy Program	1,184	0	1,184
Bioenergy	2,500	0	2,500
Subtotal, Biomass Power Systems	37,084	+670	37,754
Biofuels Energy Systems			
Ethanol Production	34,666	+785	35,451
Renewable Diesel Alternatives	750	0	750
Feedstock Production	3,500	0	3,500
Regional Biomass Energy Program	2,000	0	2,000
Integrated Bioenergy Research	2,500	0	2,500
Subtotal, Biofuels Systems	43,416	+785	44,201
Total, Biomass/Biofuels Energy Systems	80,500	+1,455	81,955

Detailed Program Justification

(dollars in thousands)

FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
-------------------------------	----------------------------------	-------------------------------

BIOPOWER ENERGY SYSTEMS:

Systems Development	25,900	+670	26,570
▪ Small Modular Biopower	5,000	+670	5,670

This additional funding will allow the program to expand its R&D efforts to examine a broader range of feedstocks for SMB systems. The program will develop, in partnership with industry, SMB systems that can exploit the vast agricultural and urban clean waste streams and convert them into heat and electricity. This will be accomplished by integrating small-scale gasifiers with advanced power generating components such as engines, microturbines and fuel cells, thus increasing the flexibility and applicability of these systems. Such hybrid systems significantly improve energy conversion efficiencies, and reduce harmful gaseous and particulate emissions.

(dollars in thousands)

	FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
▪ Other Systems Development	20,900	0	20,900
Total, Systems Development	25,900	+670	26,570

BIOFUELS ENERGY SYSTEMS:

Ethanol Production	34,666	+785	35,451
▪ Advanced Fermentation Organisms R&D	5,000	+785	5,785

The Biofuels Program has identified ethanol as the most promising of the liquid transportation fuels options in the near- and mid-term. Increased funding of \$785,000 is in addition to the \$2,000,000 increase in the FY 2002 Congressional Request from an enacted FY 2001 level of \$3,000,000. The additional funds will increase the number of research and development awards under the planned FY 2002 solicitation to initiate and develop a yeast platform for the production of biofuels and biobased chemical products from biomass sugar streams, in collaboration with academia and industry. The work solicited will include screening, selection, and genetic manipulation of promising strains that can ferment all of the biomass derived sugars, including glucose, arabinose and xylose, to ethanol and other high value biobased chemicals. This effort is critical to providing technology to meet the cost goals for the ethanol blend market.

▪ Other Ethanol Production	29,666	0	29,666
Total, Ethanol Production	34,666	+785	35,451

Hydrogen Research

Mission Supporting Goals and Objectives

The amended funding request will permit attainment of the 2010 goals to produce hydrogen from natural gas at a cost of \$12-15 per million BTU and provide a 5,000 psi storage capability. The benefit will be a zero emission fuel for fuel cell vehicles that is cost-competitive with today's price of gasoline in conventional vehicles. The funding will also support research on reversible fuel cell systems which, by 2005, are estimated to be able to both generate electricity from hydrogen and use excess electricity from any other source to produce hydrogen for storage. The benefits will be a clean fuel for distributed generation and a new way to store electricity for over 6-8 hours. The amended funding will also support earlier corroboration of hydrogen production from biomass as well as wind. The benefit will be to accelerate development of these promising hydrogen production systems.

Funding Schedule

(dollars in thousands)

	FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
Core Research and Development	7,900	+6,931	14,831
Technology Validation	4,900	+4,100	9,000
Analysis and Outreach	1,100	+1,950	3,050
Total, Hydrogen Research and Development	13,900	+12,981	26,881

Detailed Program Justification

(dollars in thousands)

	FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
Core Research and Development	7,900	+6,931	14,831
<ul style="list-style-type: none"> ■ Thermal Processes Restores the Ion Transport Membrane milestone to its original schedule and continues the development of other advanced reformer concepts that can reduce the cost of hydrogen production by 25 percent and thereby reduce the cost of electricity generated using fuel cells. Phase 2 projects that produce hydrogen from biomass will be funded. Hydrogen Program collaboration with the Office of Fossil Energy to convert coal to hydrogen will be fully supported. Additional support will allow Hydrogen Program collaboration to achieve \$6-8/MMBtu hydrogen produced at the mine mouth by 2015. 	2,840	+2,690	5,530
<ul style="list-style-type: none"> ■ Photolytic Processes Allows the completion of the photoelectrochemical production milestone in FY 2002, and full funding of three laboratory projects and three university projects developing semiconductors to split water into hydrogen and oxygen. 	1,660	+1,070	2,730
<ul style="list-style-type: none"> ■ Storage Restores the FY 2002 milestone to fabricate a laboratory prototype storage tank using advanced adsorbents, and permits continuance of three university, three industry and two national laboratory projects developing carbon and hydride adsorbents for on- board vehicular and stationary storage. In addition, two industry and two university efforts will proceed into Phase 2 for the development of new storage concepts. 	1,800	+2,065	3,865
<ul style="list-style-type: none"> ■ Utilization Permits the completion of the solid oxide electrolyser milestone in FY 2002 as originally planned. Proceed into Phase 2 with several industry and university sensor systems for leak detection in vehicles and stationary generation systems. 	1,600	+1,106	2,706
Technology Validation	4,900	+4,100	9,000
<ul style="list-style-type: none"> ■ Renewable Energy Systems Permits two industry cost-shared projects to continue the development of lower cost options for electrolysis systems to achieve reductions by a factor of two in FY 2002 and by another factor of two goal by FY 2005. The biomass to hydrogen project will be restored to its original schedule. 	1,080	+1,070	2,150
<ul style="list-style-type: none"> ■ Distributed/Remote Power Restores the power park validation efforts, allowing industry to complete the first phase and proceed into Phase 2. 	450	+700	1,150

(dollars in thousands)

FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
-------------------------------	----------------------------------	-------------------------------

▪ Hydrogen Infrastructure	3,370	+2,330	5,700
Permits the funding of several industry storage and refueling projects selected in collaboration with the Office of Transportation Technologies and State agencies.			
Analysis and Outreach	1,100	+1,950	3,050
Restores education-related activities and allows completion of several outreach projects for use in the codes and standards activities. Supports an extensive set of analyses to guide the hydrogen research efforts.			
Total, Hydrogen Research	13,900	+12,981	26,881

Hydropower

Mission Supporting Goals and Objectives

The amended funding request for the Hydropower program will facilitate the development of a commercially viable turbine technology capable of reducing the rate of fish mortality to 2 percent or lower by 2010 (vs 2015 as stated in the FY 2002 Congressional Budget). Current turbine-passage mortalities are 5 to 10 percent for the best existing turbines and 30 percent or greater for some turbines. The new turbines will also maintain downstream dissolved oxygen levels of at least 6 mg/L to ensure compliance with water quality standards. The additional funds will allow an accelerated development of a full-scale prototype by completing the pilot-scale testing in FY 2002. Developing more environmentally friendly turbine technology will allow greater electricity production to occur while also protecting fish at the same levels.

Over three hundred hydropower licenses will expire over the next two decades, making accelerated development of technology solutions critical. In addition, the increased funding will support testing of low-head/low power turbine designs opening, which may produce electricity in a more environmentally-friendly manner.

Funding Schedule

(dollars in thousands)

	FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
Advanced Turbine Research and Development	2,500	+2,489	4,989
Total, Hydropower	2,500	+2,489	4,989

Detailed Program Justification

(dollars in thousands)

	FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
Advanced Turbine Research and Development	2,500	+2,489	4,989
<ul style="list-style-type: none"> ▪ Large Turbine Testing 0 +1,500 1,500 Initiate cost-shared testing and support of competitively selected environmentally-friendly large turbine (greater than 1 MW) designs developed by industry. ▪ Low-Head/Low-Power Testing 0 +900 900 Initiate cost-shared testing and support of competitively selected environmentally-friendly low-head/low-power turbine designs developed by industry. 			

(dollars in thousands)

	FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
▪ Mini-Hydro Research and Development	700	+89	789
Enhances the assessment of potential mini-hydro through (1) cost-shared biological field verification of mini-hydro turbine systems to determine biological and hydraulic performance resource assessment and (2) analysis activities.			
▪ Other Hydropower	1,800	0	1,800
Total, Hydropower	2,500	+2,489	4,989

Electric Energy Systems and Storage

Mission Supporting Goals and Objectives

The amended budget request will support pre-commercial High Temperature Superconductivity (HTS) research and development in partnership with industry to enhance the capacity, efficiency, and reliability of electricity delivery and end-use.

Funding Schedule

(dollars in thousands)

	FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
High Temperature Superconducting R&D	19,000	+17,819	36,819
Energy Storage Systems	5,987	0	5,987
Transmission Reliability	8,940	0	8,940
Total, Electric Energy Systems and Storage	33,927	+17,819	51,746

Detailed Program Justification

(dollars in thousands)

	FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
High Temperature Superconducting R&D	19,000	+17,819	36,819
<ul style="list-style-type: none"> ■ Superconductivity Partnership Initiative 5,000 +9,000 14,000 			

Select and fund the most innovative proposals for design and testing of new innovative electrical systems using the latest high temperature superconducting wire. The design of these new systems will include the Second Generation Wire so that new prototypes can be tested when the wire becomes available. The benefit will be additional projects to complete a portfolio of advanced electric grid technologies (including power cables, transformers, motors and generators) needed to rebuild the U.S. electric system over the next 5-15 years. Most of the existing equipment must be replaced during this period because of age, and additional investment will also be needed to accommodate the larger power transfers as the industry is deregulated.

(dollars in thousands)

FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
-------------------------------	----------------------------------	-------------------------------

- **Second Generation Wire Initiative** 8,000 +4,100 12,100
The amendment will bring funding for these activities up to the current FY 2001 level. As a result, industrial consortia will work with national laboratories to develop high-performance, low-cost, second-generation, high temperature superconducting wire. Performance will be measured by the first 100-meter length production of second-generation high temperature superconducting wire. The Accelerated Coated Conductor Initiative, begun by Congress in FY 2001, will continue the joint efforts among DOE laboratories, American industry, and universities to accelerate the development, commercialization, and application of high temperature superconductors.
- **Strategic Research** 6,000 +4,719 10,719

The amendment will bring funding for these activities up the current FY 2001 level. As result, fundamental research activities will be supported to better understand relationships between the microstructure of HTS materials and their ability to carry large electric currents over long lengths. Several additional projects will be added to investigate the varied technical aspects of this key problem. The benefit will be higher performance wires and inherently lower manufacturing costs. Also, work on enabling technologies such as joining HTS conductors to normal conductors will be supported as well as additional research on electrical losses due to alternating currents. These losses are significant, but can be reduced through better understanding of technical parameters.

Other Electric Energy Systems and Storage	14,927	0	14,927
Total, Electric Energy Systems and Storage	33,927	+17,819	51,746

Renewable Support and Implementation

Mission Supporting Goals and Objectives

The amended budget request will encourage the use of renewable energy technologies by state and local governmental entities and non-profit electric cooperatives in the U.S. as well as renewable energy technologies by developed and developing countries. The amendment will add funds to the following programs:

International Renewable Energy Program

The International Renewable Energy Program (IREP) will encourage acceptance and use of renewable energy technologies by developed and developing countries in support of U.S. national interests and policies. The IREP directly supports broader Departmental strategic plans and objectives focusing on emerging energy issues and market development.

Renewable Energy Production Incentive

The Renewable Energy Production Incentive encourages state and local governmental entities (usually public power electric utilities) and non-profit electric cooperatives to acquire renewable energy generation resources. The additional funds will provide payments to Tier 2 projects at a rate comparable to that paid in previous years. Tier 1 Category projects which exploit solar, wind, geothermal, or closed loop biomass technologies receive priority for Renewable Energy Production Incentive (REPI) payments over systems that use allowable open-loop biomass technologies (Tier 2).

Funding Schedule

(dollars in thousands)

	FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
Departmental Energy Management	1,000	0	1,000
International Renewable Energy Program	0	+2,500	2,500
Renewable Energy Production Incentive Program	2,059	+1,932	3,991
Renewable Program Support	2,059	0	2,059
Total, Renewable Support and Implementation	5,118	+4,432	9,550

Detailed Program Justification

(dollars in thousands)

	FY 2002 Pending Request	FY 2002 Proposed Amendment	FY 2002 Revised Request
International Renewable Energy Program	0	+2,500	2,500
<ul style="list-style-type: none"> ■ U.S. Initiative on Joint Implementation 	0	+2,500	2,500
<p>The International Renewable Energy Program (IREP) will provide technical assistance, disseminate information, conduct trade missions, and reverse trade missions, under the U.S. Initiative on Joint Implementation. The IREP will facilitate the use of U.S. renewable energy technologies; provide sector project development; and reduce non-technical barriers (e.g., financing, resources, tariffs, and local prohibitions).</p>			
Renewable Energy Production Incentive Program	2,059	+1,932	3,991
<p>Additional funding will support an estimated additional 115,000 mWh of Tier 2 (open-loop biomass, mostly landfill gas) generation, raising the financial incentive payout rate to approximately 5.5–7 percent of eligible Tier 2 generation. For tax-exempt owners of new renewable energy generation systems, the Renewable Energy Production Incentive (REPI) Program provides financial incentives that are comparable to the dollar value of either production tax incentives or investment tax credits now available to private-sector owners of certain new renewable energy generation systems. Each qualified facility which is operational during the 1994–2003 time frame can receive incentive payments for net electricity production during its first ten years of operation. Such support is authorized by the Energy Policy Act of 1992.</p>			
Other Renewable Support and Implementation	3,059	0	3,059
Total, Renewable Support and Implementation	5,118	+4,432	9,550